

ture islands, wagon roads were under water, with nothing to indicate the roadway except the tops of fences on either side.

Chattanooga, Tenn.: rain began 2.37 a. m. and ended 9.35 a. m., 30th, falling at times very heavily; 2.55 inches fell in less than seven hours. The sewers were inadequate to carry

off the water, and the city was flooded in various places to a depth of from one to twenty-three inches.

HIGH TIDES.

Baltimore, Md.: considerable damage resulted from the high tide along the water front on the 31st. Many of the wharves were submerged by water during the day.

ATMOSPHERIC ELECTRICITY.

AURORAS.

On the Atlantic coast auroras were reported as far south as Egg Harbor City, N. J. West of the Atlantic coast auroras were not reported south of the fortieth parallel. The most notable displays occurred on the 21st, when they were observed in New Hampshire, Iowa, and Minnesota.

The following reports have been made of the more important displays noted:

Duluth, Minn.: an aurora was observed from 10.35 p. m. 21st to 1.20 a. m. 22d. It extended from about 160° to 200° azimuth, and to about 25° altitude. The display was very faint and consisted simply of a pale whitish light.

Saint Vincent, Minn.: an aurora consisting of a confused mass of light, which rose to altitude 12°, and extended from azimuth 145° to 220°, was observed from 11 p. m. 21st to 12.20 a. m. 22d.

Eastport, Me.: a faint auroral arch which rose to altitude 17°, and covered 90° of the horizon, from within a few degrees of east-northeast to northwest, was observed from 8.45 to 10.30 p. m. 26th.

Auroras were observed during the month as follows: 3d, Peking, Ill.; Cresco, Iowa. 5th, West Milan, N. H. 10th, Royalston, Mass. 13th, Grantsburgh, Wis. 18th, South Canisteo, N. Y. 21st, Dysart, Iowa; Duluth and Saint Vincent, Minn.; Nashua, N. H. 23d, South Canisteo, N. Y. 25th, Tatoosh Island, Wash. 26th, Eastport and Mayfield, Me.; Royalston, Mass. 27th, South Canisteo, N. Y. 28th, Bev-

erly, N. J. 30th, Egg Harbor City, N. J.; South Canisteo, N. Y. 31st, Dysart, Iowa.

THUNDER-STORMS.

The more severe thunder-storms are described under "Local storms." Thunder-storms were reported in the greatest number of states and territories, twenty-seven, on the 13th; in twenty-six on the 10th and 29th; in twenty-four on the 14th, 20th, and 27th; in twenty-two on the 21st, 25th, and 30th; in twenty-one on the 26th; in from fifteen to twenty, inclusive, on the 11th, 12th, 17th to 20th, 22d to 24th, and 28th; in from ten to fourteen, inclusive, on the 1st, 7th, 9th, 15th, 16th, and 31st; in from five to nine, inclusive, on the 2d to 6th, and 8th. There were no dates for which thunder-storms were not reported in one or more states or territories.

Thunder-storms were reported on the greatest number of dates, twenty-nine, in Kansas; on twenty-one in Illinois; on twenty in Iowa and Michigan; on from fifteen to nineteen, inclusive, in Minnesota, Missouri, North Carolina, Ohio, Pennsylvania, and Texas; on from ten to fourteen, inclusive, in Alabama, California, Dakota, District of Columbia, Indiana, Indian Ter., Louisiana, Maryland, Massachusetts, Nebraska, New York, South Carolina, Tennessee, Virginia, and Wisconsin; on from five to nine, inclusive, in Arkansas, Colorado, Florida, Georgia, Kentucky, Mississippi, Montana, Nevada, New Jersey, Oregon, Washington, West Virginia, and Vermont. There were no states or territories in which thunder-storms were not reported for one or more dates.

MISCELLANEOUS PHENOMENA.

PRAIRIE FIRES.

Prairie fires were reported during the month as follows: New England City, Dak., and Saint Vincent, Minn., 3d; Saint Cloud, Minn., 7th; Fort Sill, Ind. T., 11th.

FOREST FIRES.

Duluth, Minn., 7th: destructive forest fires are still raging in all directions, but in many localities they have burned themselves out. They have attacked the heavy pine woods in many places, and the loss of timber will be very large. Several hundred thousand ties, and thousands of cords of wood have been burned. Numerous buildings, hay, meadows, crops, and bridges have been burned in the western part of the county. Farmers and mill men in the country are fighting the fires. The air in the city is filled with smoke.—*Chicago, Ill., Tribune, May 7.*

La Crosse, Wis.: extensive forest fires prevailed in the northern part of the state on the 4th, 5th, and 6th, and owing to the dry weather the fires burned fiercely. Railroad men arriving over the Omaha road on the 4th report that the forest from Ashland to Clear Lake, one hundred and fifty miles, is ablaze. Many thousands of ties have been destroyed and some towns endangered. On the Fond du Lac Indian reservation \$50,000 worth of logs and skids were burned. The heavy rain which fell on the 7th in the northern section of the state, partially extinguished the fires.

Mason City, Cerro Gordo Co., Iowa, 8th: destructive fires have been burning in the woods between Plymouth and Rock Falls, this county, since the evening of the 4th. So far the

farmers have been able to save their homes.—*Union and Advertiser, Rochester, N. Y., May 8.*

Newburgh, Orange Co., N. Y., 8th: forest fires are burning in the Shallangunk Mountains and in the Catskills; also in the highlands below this city, and on the Fishkill Mountains. Passengers on the New York and New England road state that the fires are burning on the mountains in that vicinity and on the state line. A large amount of wood land has been seriously damaged. The fires are reported to be on the increase in all directions.—*Democrat and Chronicle, Rochester, N. Y., May 9.*

Michigan: reports from various points in the upper peninsula show that severe forest fires have been in progress in that section since about the 5th; fences, cord wood, shingles, posts, and standing timber have been consumed. It is estimated that half a million feet of logs have been burned, the crops ruined in many localities, and a large number of buildings destroyed. Reports also show that destructive fires were general at about the same time in the northern portion of the state, and in Ottawa, Muskegon, Midland, Clare, Gladwin, and Osceola counties, in the middle portion; in Lenawee county, in the southeastern, and Allegan county in the southwestern portion of the state. The light rain in the upper peninsula on the 8th, and in the southern half of the state on the 10th, and the general rain throughout the state from the 15th to the 22d extinguished the fires.

Custer City, McKean Co., Pa., 8th: a fierce forest fire has been raging about the Moody tract, five miles south of this place, all day. The tract is one of the most valuable oil properties in this county, and a large number of rigs and small

tanks of oil are reported destroyed. A big forest fire is in progress in the lumber woods near Kane, this county, and is working its way rapidly towards Porter station. There are fires on all sides of here, and another large one is plainly seen to the northwest.—*Chicago, Ill., Tribune, May 9.*

Alachua, Alachua Co., Fla., 31st: the forest fire which has been raging in this section has done considerable damage to fences.—*The (Savannah, Ga.) Morning News, June 2.*

Forest fires were also reported as follows: Fort Apache, Ariz., 6th, 12th, 18th, 24th, 31st; Green Bay, Wis., 6th.

HALOS.

Solar halos were most frequently reported in Michigan, where they were noted on twenty-two days; in New York on twenty days; in Ohio on seventeen days; in California, Illinois, Nevada, Tennessee, and Washington Territory on from ten to fifteen days; in Dakota, Indiana, Iowa, Kansas, Massachusetts, Minnesota, Oregon, Pennsylvania, South Carolina, Texas, and Wisconsin on from five to nine days; in Arizona, Arkansas, Florida, Georgia, Idaho, Indian Territory, Kentucky, Maine, Maryland, Mississippi, Missouri, Montana, Nebraska, North Carolina, Utah, Virginia, and Vermont on from one to four days. In states and territories other than those named no solar halos were reported. They were noted in the greatest number of states and territories, sixteen, on the 1st; in fourteen on the 30th; in twelve on the 22d; in eleven on the 25th; in from five to ten on the 3d to 9th, 11th to 20th, 23d, 24th, 26th to 29th, and 31st. There were no days for which solar halos were not reported in one or more states or territories.

Oswego, N. Y.: a partial solar halo of 22° radius was observed at 8 a. m.; it became complete about 8.45 a. m., and was visible until 2.40 p. m. At 9.15 a. m. an elongated ellipse, covering about 92° of the horizon, appeared; the southern half mostly within the lower half of the halo, its upper edge directly over the sun. At this time a contact arch was observed below, and another arch below and to the left of the halo; an arch of greater diameter and altitude was also seen in the west. The circle and arches showed a fair amount of color, while the ellipse was faint. At 9.30 a. m. the halo was double on its north and south sides, and the ellipse at its northern extremity; the contact arch had disappeared. The display was brightest and best defined at 9.25 a. m., the ellipse becoming brilliant and well defined.

Lunar halos were most frequently reported in Ohio, where they were noted on twelve dates; in Illinois, Indiana, Iowa, Louisiana, Missouri, Tennessee, and Virginia on from five to ten dates; in Alabama, California, Colorado, Dakota, Florida, Georgia, Idaho, Kansas, Kentucky, Maine, Maryland, Massachusetts, Minnesota, Mississippi, Montana, Nebraska, Nevada, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Texas, and Wisconsin on from one to four dates. In states and territories other than those named no lunar halos were reported. They were reported in the greatest number of states and territories, fourteen, on the 9th; in thirteen on the 10th and 11th; in twelve on the 7th and 12th; in from five to ten on the 5th, 6th, 8th, 13th, and 14th; in from one to four on the 3d, 4th, 15th to 17th, 20th, 27th, 29th, and 30th. For dates other than those given no lunar halos were reported.

METEORS.

The distribution of meteors, by dates, was as follows: 1st, Villa City, Fla.; 3d, Whipple Barracks, Ariz.; 7th, Nashville, Tenn.; 9th, Saint Louis, Mo.; 11th, Wheeling, W. Va.; 12th, Wedgwood, N. Y.; Jefferson, Ohio; 17th, Whipple Barracks, Ariz.; 18th, Villa City, Fla.; Nashua, N. H.; 22d, Auburn, Ala.; 23d, Point Peter, Ga.; East Portland, Oregon; 24th, Auburn, Ala.; Yellow Springs, Ohio; 25th, Kissimmee, Fla.; 26th, Villa City, Fla.; 31st, Fort Smith, Ark.

The following are descriptions of the more notable meteoric displays reported: Whipple Barracks, Ariz., 3d: two meteors were observed in the evening. The first was clear and distinct; was seen at altitude 70° and azimuth 105°; traveled

about 20° in a northwesterly direction and disappeared. The second was observed at midnight in about altitude 60°, and azimuth 75°, and passed about 25° in a northerly direction. This meteor was very brilliant and left an illuminated path which was visible for about five seconds.

Saint Louis, Mo.: a meteor of large size is reported to have passed across the sky from northwest to southeast at 5.25 p. m., 9th. The meteor left a crimson light in its path for about half of its passage.

Wheeling, W. Va.: a large meteor fell near Addison, Webster Co., on the 11th. It was about five feet in diameter, and was first seen over the mountain north of the village. It passed through the air in a semi-circle, with a loud whizzing sound, and buried itself in the ground near Cogar's Mill, the fall jarring the earth for a radius of two or three miles. It had the appearance of a ball of fire, lighting up the sky for miles around.—*The (Nashville, Tenn.) Examiner.*

Auburn, Lee Co., Ala.: during the month two large meteors were observed. One was observed at 10 p. m., 22d. It appeared at an altitude of about 80°, and moved from northeast to south. The meteor was accompanied by a hissing noise, which became louder, and finally ended in an explosion, bursting into several pieces. The other one was observed at 7.55 p. m., 24th, in about altitude 70° and moved in a northeasterly direction.—*Report by A. St. C. Dunstan to the Alabama State Weather Service.*

Fort Smith, Ark., 31st: a brilliant meteor passed across the sky from northeast to southwest and exploded when about 30° above the southwestern horizon. Its path was indicated by a sheen of white light which lasted several seconds after the passage of the meteor.

MIRAGE.

San Diego, Cal., 29th: a mirage was observed in the southwest at 1 p. m. The Coronado Hotel and grounds and the Point Loma light-house and out-buildings were plainly seen.

Palmyra, Wayne Co., N. Y., 1st: a distinct mirage was observed off Lake Ontario at 10 a. m. but faded rapidly away. It was again seen at 2.30 p. m. and remained visible for about thirty minutes. The shores of Canada could be seen with the naked eye, and with a glass a vessel and white-cap waves could be plainly distinguished.—*Democrat and Chronicle, Rochester, N. Y., May 2.*

Mirage were observed at Webster, Dak., on the 1st, 2d, 3d, 9th, 10th, 13th, 21st, 23d, 27th to 30th.

SAND STORMS.

Salt Lake City, Utah: a sand storm, the severest experienced here for years, occurred the afternoon of the 5th. The wind attained a maximum velocity of thirty-six miles per hour and the sand in the atmosphere was, at times, so dense that objects across the street could not be distinguished.

Harrisburg, Pa., 10th: a terrific wind and sand storm began 4.10 p. m. and lasted about twenty minutes, the sand and dust being so thick that they obstructed the view across the street. Sand storms were also reported as follows: Fresno, Cal., 2d, 5th, 14th; San Carlos, Ariz., 5th to 8th, 14th, 15th; Concordia, Kans., 6th; Wilcox, Ariz., 7th, 8th, 15th, 16th, 22d, 23d, 24th; Yuma, Ariz., 8th, 15th, 16th; Holbrook, Ariz., 15th.

DROUGHT.

Protracted droughts, resulting in serious damage to crops, were reported in sections of the Southern States.

Salt Lake City, Utah: southward from Utah county the country never looked drier than at the present time. In the south end of San Pete Valley the stream from which Gunnison receives its water supply is nearly invisible, the channel being dry under the bridge at that town. In Sevier Valley the situation is the same.—*Salt Lake, Utah, Evening News, May 3.*

The drought which was becoming severe in the southern half of Michigan was broken on the 10th by light, well-distributed showers.—*Report of the Michigan State Weather Service.*

Key West, Fla., 13th: since April 4th there has been no

material rainfall in this section, and the want of drinking water is beginning to be felt.

Fernandina, Nassau Co., Fla.: nearly a month has passed since any rain fell at this place. The growing crops have been damaged, the cisterns are dry, and the shade trees are drooping.—*The (Savannah, Ga.,) Morning News, May 20.*

Wainright, Charlton Co., Ga., 24th: the drought is having a damaging effect upon the growing crops. Gardens are ruined and vegetation in some places is parched and dry.—*The (Savannah, Ga.,) Morning News, May 25.*

Memphis, Tenn.: the drought which has prevailed in this section since the 1st of the month was broken on the 25th.

Convent, Saint James Parish, La.: no rain fell from the 1st to the 28th, when a storm occurred in the lower half of the parish. The dry weather and the low stage of the Mississippi River have proved very unfavorable, especially to the rice crop, over six thousand acres of which have been abandoned.—*Report of Prof. F. Greene to the Louisiana State Weather Service.*

Hammock, Alachua Co., Fla., 29th: owing to a scarcity of rain there is a heavy loss in the vegetable crop. Sixty-five per cent. will not more than cover the damage. It is about seven weeks since rain fell. The drought has caused a discontinuance of shipping of northern winter cabbage.—*The (Savannah, Ga.,) Morning News, May 30.*

Montgomery, Ala.: crops are suffering severely from drought, and small streams are drying up. A beneficent rain fell on the 29th and 30th, breaking the drought.

Charlotte, N. C.: farmers report that the crops are drying up and that cotton is rotting in the ground. The heavy rain on the 30th broke the drought.

Hammond, Tangipahoa Parish, La.: excepting 0.03 inch of rain which fell on May 25th, there has been no rain since April 13th to May 29th, when 0.13 inch fell.—*Report of Mr. W. A. Reed to the Louisiana State Weather Service.*

Chattanooga, Tenn.: the protracted drought has been very disastrous to crops. The strawberry crop is seriously damaged, and little or no garden produce has been raised. Heavy rain fell on the 29th and 30th, breaking the drought.

Savannah, Ga.: a severe drought prevailed from the 1st to the 30th, doing much injury to crops on truck farms. Total precipitation for the month, 0.35 inch; this is the least on record for May at this station since 1871.

Augusta, Ga.: all crops in this section are suffering from the prevailing dry weather. The rain on the 30th, 0.81 inch, was the first rain of any consequence since the 1st of the month.

Fort Apache, Ariz., 31st: no rain has fallen since April 10th, and the drought is severely felt in this section.

Clinton, East Feliciana Parish, La., 31st: the month has been unusually dry. The rain of the 29th did not extend all over the parish, and the southern and southwestern portions are in need of rain. Grasshoppers are reported as doing some damage to cotton.—*Report of Mr. J. A. White, jr., to the Louisiana State Weather Service.*

Cedar Keys, Fla., 31st: the almost entire absence of rainfall during the month has severely embarrassed the farming interest in this section; cisterns in the city are dry. Records show that the least rainfall in May since the opening of the Signal Service station at this point in 1879 was 0.71, in 1886.

University, Miss., 31st: crops suffered severely from drought during the month, until the 25th; after that date rain occurred, breaking the drought.

Cameron, Cameron Parish, La., 31st: the unusual dryness during the month has damaged vegetation, and has been very unfavorable to the farming interests. The early corn is a failure, and the usual area of late corn has not been planted.—*Report of Hon. S. P. Henry to the Louisiana State Weather Service.*

Grand Coteau, Saint Landry Parish, La., 31st: the total rainfall since February 1st has been but 8.06 inches, of which 0.21 fell during the present month; the average for the same period of former years is 24.60 inches. As a consequence of the prevailing drought cotton rises slowly, and those who are late have not been able to plant. Cisterns commence to fail,

the bayous and ponds are dry, and the cattle suffer on the prairie, where the grass is parched. *Report of Rev. C. M. Widman, S. J., to the Louisiana State Weather Service.*

SUN SPOTS.

Haverford College Observatory, Pa. (observed by Mr. H. V. Gummere):

Date, May, 1889.	Number of new—		Disappeared by solar rotation.	Reappeared by solar rotation.	Total number visible.		Facule.	Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	
2, 10 a. m. ...	0	0	0	0	0	0	0	Definition very good.
4, 12 m.	0	0	0	0	0	0	0	Definition fair.
6, 11 a. m. ...	1	1	0	0	1	3	2	15 Definition very good.
7, 12 m.	0	0	0	0	0	6	1	14 Definition fair.
8, 10 a. m. ...	0	0	0	0	0	8	1	9 Definition fair.
9, 11 a. m. ...	0	0	0	0	0	8	6	11 Definition good.
10, 10 a. m. ...	0	0	0	0	0	7	0	0 Definition poor.
14, 11 a. m. ...	0	0	0	0	0	0	1	1 Definition good.
15, 11 a. m. ...	0	0	0	0	0	0	2	2 Definition very good.
16, 11 a. m. ...	0	0	0	0	0	0	4	22 Definition very good.
17, 9 a. m. ...	0	0	0	0	0	0	3	27 Definition very good.
18, 10 a. m. ...	0	0	0	0	0	0	1	1 Definition poor.
21, 10 a. m. ...	0	0	0	0	0	0	0	0 Definition poor.
22, 9 a. m. ...	0	0	0	0	0	0	1	2 Definition good.
23, 10 a. m. ...	0	0	0	0	0	0	1	2 Definition very good.
25, 10 a. m. ...	0	0	0	0	0	0	5	9 Definition very good.
28, 11 a. m. ...	0	0	0	0	0	0	3	9 Definition very good.
29, 11 a. m. ...	0	0	0	0	0	0	0	0 Definition very poor.
30, 11 a. m. ...	0	0	0	0	0	0	1	6 Definition very good.

Mr. John W. James, Riley, McHenry Co., Ill.: one group of four or five spots was observed on east edge of sun, 6th; vanished between 8th and 10th. No others seen during the rest of the month. Mr. C. E. Bozzell, Leaf River, Ogle Co., Ill., May 5th: a group of spots, surrounded by prominent faculae, appeared by rotation on east limb, south of equator. This group was in a constant state of change, and disappeared on the 9th. Mr. M. A. Veeder, Lyons, Wayne Co., N. Y., May 19th: western faculae disappeared by rotation; extensive faculae, eastern quadrant; 20th and 21st, no observation taken. 22d to 25th, inclusive, faculae only—not bright. 26th to 30th, inclusive, observation poor, faculae only. 31st, no observation.

SHOWER OF FISHES.

Wichita, Kans.: during a thunder-storm which occurred the afternoon of the 10th a shower of fishes, from one to four inches long, fell at the Burton Car Works, four miles north of this city. They covered the ground in thousands. One, brought to police headquarters, was a small catfish about three and three-fourths inches long, such as abound in the streams hereabouts.—*Report of Signal Service observer.*

RAIN FROM CLOUDLESS SKY.

Portland, Oregon, 4th: at 2.10 a. m. rain fell for five minutes in small fine drops, with a perfectly clear sky, and wind blowing at the rate of about one mile per hour.—*Report of Signal Service observer.*

VERIFICATIONS.

The percentages of the official forecasts of the Signal Service for May, 1889, were not completed in time to be published in this issue of the REVIEW.

Percentages of local verifications of weather and temperature signals as reported by directors of the various State Weather Services for May, 1889.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Illinois	68.8	65.5	Nebraska	83.1	90.7
Indiana	77.1	81.6	New Jersey	77.4	83.2
Kansas	85.6	86.0	New York	84.0	81.0
Kentucky	87.0	84.0	North Carolina	79.1	77.6
Louisiana (Northern)	76.0	84.0	Ohio	81.0	86.0
Louisiana (Southern)	88.0	98.0	Pennsylvania	83.0	87.0
Michigan	72.5	71.8	South Carolina	85.0	80.0
Minnesota	81.0	79.0	Tennessee	88.7	84.6